Claims:

1. In a WDM optical communication system that includes a plurality of nodes interconnected by communication links, a node, comprising:

a first plurality of transponders each generating and/or receiving an information-bearing optical signal at a different channel wavelength from one another;

an optical coupling arrangement transferring the channel wavelengths between a link connected to the node and the first plurality of transponders, said arrangement being adaptable to reconfigure its operational state to selectively direct different ones of the channel wavelengths from the link to different ones of the transponders without disturbing the optical path through the node traversed by any other channel wavelengths; and

a communications and configuration arrangement transferring data identifying the respective channel wavelengths at which the transponders operate from the transponders to the optical coupling arrangement and, in response to the transferred data, reconfiguring the operational state of the optical coupling arrangement.

2. In the system of claim 1, a node wherein the first plurality of transponders respectively include a plurality of receivers receiving the information-bearing optical signals, and further wherein the communications and configuration arrangement reconfigures the operational state of at least the portion of the optical coupling arrangement transferring the channel wavelengths from the link to the first plurality of transponders so that the transponders can receive optical signals at the channel wavelengths at which they respectively operate.

3. In the system of claim 1, a node wherein said transponders each include an identifying element containing data identifying the respective channel wavelengths at which the transponders operate, said optical coupling arrangement having a receiving element for obtaining the data contained in the identifying element.

4. In the system of claim 1, a node in which said optical coupling arrangement includes a tunable coupling arrangement for selectively transferring the

different ones of the channel wavelengths from the link to the first plurality of transponders and a passive coupling arrangement for directing the channel wavelengths from transponders to the link.

5. In the system of claim 1, a node in which said optical coupling arrangement includes a reconfigurable optical switch having at least three ports, said reconfigurable optical switch being adaptable to reconfigure its operational state to receive at any of the ports any of the channel wavelengths at which the first plurality of transponders operate and direct said channel wavelengths to any of the other ports of the optical switch.

6. In the system of claim 1, a node in which said optical coupling arrangement includes a reconfigurable optical switch having at least three ports, said reconfigurable optical switch being adaptable to reconfigure its operational state to receive at a plurality of the ports any of the channel wavelengths at which the first plurality of transmitters operate and direct said channel wavelengths to any remaining ones of the ports of the optical switch.

7. In the system of claim 1, a node further comprising a second plurality of transponders serving as backup transponders in the event of a failure in one or more of the transponders in the first plurality of transponders.

8. In the system of claim 7, a node in which said optical coupling arrangement includes at least two reconfigurable optical switches each having at least three ports, a first of said reconfigurable optical switches being adaptable to reconfigure its operational state to drop channel wavelengths to the first plurality of transponders and receive channel wavelengths from the second plurality of transponders, a second of said reconfigurable optical switches being adaptable to reconfigure its operational state to drop channel wavelengths to the second plurality of transponders and receive channel wavelengths from the first plurality of transponders

9. In the system of claim 7, a node wherein the first and second plurality of transponders are arranged in transponder pairs comprising transponders from each of the first and second plurality of transponders.

10. In the system of claim 9, a node wherein the transponders in each of the transponder pairs are located in adjacent slots in electrical connection with one another for transferring electrical data signals therebetween.

11. In the system of claim 10, a node wherein the transponders in each of the transponder pairs operate at a common channel wavelength.

12. In the system of claim 10, a node wherein the transponders in each of the transponder pairs operate at a different channel wavelength.

13. In the system of claim 10, a node wherein the transponders in at least one of the transponder pairs are operable at either a common channel wavelength or a different channel wavelength.

14. In the system of claim 9, a node in which said optical coupling arrangement includes at least four reconfigurable optical switches, wherein a first transponder in each of the transponder pairs transmits and receives channel wavelengths to first and second ones of the reconfigurable optical switches, respectively, and a second transponder in each of the transponder pairs transmits and receives channel wavelengths to third and fourth ones of the reconfigurable optical switches, respectively.

15. In the system of claim 10, a node in which said optical coupling arrangement includes at least four reconfigurable optical switches, wherein a first transponder in each of the transponder pairs transmits and receives channel wavelengths to first and second ones of the reconfigurable optical switches, respectively, and a second transponder in each of the transponder pairs transmits and receives channel wavelengths to third and fourth ones of the reconfigurable optical switches, respectively.

16. In the system of claim 9, a node in which said optical coupling arrangement includes at least two passive coupling arrangements and two reconfigurable optical switches each having a plurality of ports, wherein a first transponder in each of the transponder pairs sends and receives channel wavelengths from a first of the passive coupling arrangements and a first of the optical switches associated therewith and a second transponder in each of the transponder pairs sends and receives channel wavelengths from a second of the passive coupling arrangements and a second of the optical switches associated therewith.

17. In the system of claim 1, a node further comprising a blocking filtering element for filtering from the link channel wavelengths dropped by the optical coupling arrangement.

18. In the system of claim 5, a node further comprising a blocking filtering element for filtering from the link channel wavelengths dropped by the optical coupling arrangement.

19. In the system of claim 8, a node wherein the blocking filtering element is the second reconfigurable optical switch.

20. In the system of claim 3, a node in which the identifying element is a serial or model number and the receiving element is an alphanumerical input through which the data is manually received.

21. In the system of claim 3, a node further comprising means for communicating the data from the identifying element in the transponders to the node.

22. In the system of claim 3, a node in which the identifying element is a memory module and the receiving element includes a processor for reading the data from the memory module when the transducer is coupled to the optical coupling arrangement.

23. In the system of claim 5, a node wherein the first plurality of transmitters are respectively located in a plurality of transponder slots each of which optically communicates with a predetermined one of the ports of the optical switch.

24. In the system of claim 1, a node wherein the data identifying the respective channel wavelengths at which the transmitters operate is the respective channel wavelengths themselves.

25. A method for assigning channel wavelengths to a plurality of ports of an optical switch, said method comprising the steps of:

receiving a plurality of transmitters in the plurality of the ports of the optical switch, said transmitters being operable at distinct wavelengths from one another;

obtaining data from the transmitters identifying one or more operating characteristics of the transmitters, said one or more operating characteristics including the respective distinct wavelengths at which the transmitters operate; and

based on the data obtained from the transmitters, configuring the optical switch so that the plurality of ports are assigned channel wavelengths respectively corresponding to the distinct wavelengths of the transmitters received in the plurality of ports.

26. The method of claim 25 wherein the step of obtaining the data includes the step of receiving data manually input by a technician.

27. The method of claim 25 wherein the step of obtaining data includes the step of reading the data directly from the transmitter.

28. The method of claim 27 wherein the data is read from a memory module.

29. The method of claim 28 wherein said memory module is a read-only memory.

30. The method of claim 28 wherein said memory module is a random-access memory.

31. The method of claim 28 wherein said memory module is an EPROM.

32. The method of claim 28 wherein said memory module is read by a controller located in the optical switch.

33. The method of claim 26 wherein said data is a serial or model number of the transmitter.

34. The method of claim 25 wherein said transmitter is incorporated in an optical transponder.

35. The method of claim 25 wherein at least one of said transmitters is a tunable transmitter tunable to a plurality of wavelengths respectively corresponding to a plurality of channel wavelengths employed by a transmission system in which the optical switch is incorporated.

36. The method of claim 25 further comprising the step of tuning a first of the transmitters to a first wavelength corresponding to a channel wavelength employed by a transmission system in which the optical switch is incorporated, wherein the step of configuring the optical switch includes assigning the first wavelength to the port of the optical switch in which said first transmitter is received.

37. The method of claim 36 wherein the tuning step includes the step of selecting the first wavelength corresponding to the channel wavelength, said selecting step being performed by a network element located in the transmission system.

38. The method of claim 25 further comprising the step of generating an alert if one or more of the operating characteristics of one of the transmitters does not correspond to a prescribed operating characteristic.

39. The method of claim 38 wherein a comparison between the operating characteristics of said one transmitter and the prescribed operating characteristic is performed by a network element located in a transmission system in which the optical switch is incorporated.

40. The method of claim 39 wherein the network element is a network management element operating at a highest level of network control.

41. The method of claim 40 wherein the network management element employs a routing and wavelength assignment algorithm.

42. The method of claim 25 further comprising the step of generating an alert if a fault is detected prior to completion of the step of configuring the optical switch.

43. The method of claim 25 wherein said at least one operating characteristic of the transmitters further includes a power level.

44. The method of claim 25 wherein said at least one operating characteristic of the transmitters further includes a transmission format.

45. The method of claim 44 wherein the transmission format includes a transmission bit rate.

46. The method of claim 25 wherein the receiving step includes the step of receiving the plurality of transmitters in a plurality of transponder slots each of which optically communicates with a predetermined one of the ports of the optical switch.

47. The method of claim 46 further comprising the step of optically coupling in a predetermined manner the plurality of transponder slots with the ports of the optical switch, said coupling step being performed by an optical backplane.

48. The method of claim 25 wherein the data obtained from the transmitters is the distinct wavelength at which the transmitters operate.

49. A method for automatically provisioning a service in an optical transmission system having a plurality of nodes at least one of which includes at least one optical switch, said method comprising the steps of:

identifying a transponder coupled to a given port of an optical switch, said transponder being associated with the service to be provisioned;

configuring the optical switch so that the given port is assigned a channel wavelength based at least in part on the identification of the transponder.

50. The method of claim 49 further comprising the step of providing a first protection scheme for the service being provisioned.

51. The method of claim 50 further comprising the step of selectively switching between the first protection scheme and a second protection scheme for the service being provisioned.

52. The method of claim 50 wherein said first protection scheme is selected from the group consisting of a dedicated protection scheme and a shared protection scheme.

53. The method of claim 50 wherein said first protection scheme is selected from the group consisting of a dedicated protection scheme, a shared protection scheme, a dual homing path protection, a dual ring interworking scheme, and a 1:N protection scheme.

54. The method of claim 51 wherein said first and second protection schemes are selected from the group consisting of a dedicated protection scheme, a shared protection scheme, a dual homing path protection, a dual ring interworking scheme, and a 1:N protection scheme.

55. The method of claim 49 further comprising the step of identifying a backup transponder in electrical communication with said transponder and in the event of transponder failure automatically routing electrical signals from the failed transponder to the backup transponder to restore communication through the network.

56. The method of claim 55 wherein said backup transponder includes a tunable transmitter.

57. The method of claim 56 further comprising the step of tuning the tunable transmitter to a channel wavelength employed by the failed transponder.

58. The method of claim 55 wherein the backup transponder operates at a different wavelength from said transponder and further comprising the step of configuring the optical switch so the given port is assigned the different wavelength.

59. In a WDM optical communication system that includes a plurality of nodes interconnected by communication links, a node, comprising:

a reconfigurable optical switch having at least three ports;

a plurality of transmitters respectively coupled to a plurality of the ports of the optical switch, each of said transmitters generating an information-bearing optical signal at a different channel wavelength from one another, said reconfigurable optical switch being adaptable to receive at the plurality of ports any of the channel wavelengths at which the plurality of transmitters operate and direct said channel wavelengths to at least one other port; and

a communications and configuration arrangement transferring data identifying the respective channel wavelengths at which the transmitters operate from the transmitters to the optical switch and reconfiguring the optical switch in response thereto so that the plurality of ports are assigned channel wavelengths respectively corresponding to the distinct wavelengths of the transmitters received in the plurality of ports.

60. In the system of claim 59, a node wherein said transmitters include a memory module storing the data identifying the respective channel wavelengths at which

the transmitters operate, said optical switch having a processor for reading the data stored in the memory modules when the transmitters are coupled to the ports of the optical switch.

61. In the system of claim 59, a node wherein the data identifying the respective channel wavelengths at which the transmitters operate is the respective channel wavelengths themselves.

62. In the system of claim 1, a node in which said optical coupling arrangement includes at least two reconfigurable optical switches each having a plurality of ports and a passive coupler having an input port receiving channel wavelengths from the link and first and second output ports respectively coupled to ports of the two reconfigurable switches such that a first of the reconfigurable optical switches serves as a drop switch selectively directing different ones of the channel wavelengths from the link to different ones of the transponders and further such that a second of the reconfigurable optical switches serves as an add switch selectively directing different ones of the channel wavelengths from the transponders to the link, whereby at least one given channel wavelength can be both dropped by the drop switch and transmitted back to the link by the add switch.

63. In the system of claim 62, a node wherein said given channel is a broadcast channel.

64. In the system of claim 62 said given channel is a dual homing path protection channel.

65. The method of claim 49 further comprising the step of providing a shared protection scheme and a 1:N protection scheme.